



# USE OF TECHNOLOGY FOR PEDAGOGICAL PURPOSES IN THE UNDERGRADUATE CLASSROOM OF TEACHER EDUCATION

Dr. Sangeeta B. Sahay

Former Associate Professor, P.Q.H. School of Education, University of Science and Technology, Meghalaya, India.

## ABSTRACT

Preservice teachers' beliefs and attitudes increases the likelihood that they will integrate technology in their future teaching. Consequently, teacher preparation programs should provide courses designed to enhance preservice teachers' attitudes and beliefs towards technology use in the classroom. However, many programs instead focus solely on technology skills and knowledge and are not designed to encourage positive attitudes towards technology integration. It is therefore important for teacher educators to integrate technology effectively in their own classes choosing their options on the basis of best practices in this area across the globe. Present article explores the practices adopted by teacher- fraternity in this regard so as to provide them with some of the options.

**KEYWORDS:** Pedagogy, technology integration, Undergraduate teacher education, Continuous professional development, higher education.

## INTRODUCTION:

India's national education policy has witnessed a paradigm shift from the traditional chalk and-board teaching methodology to technology aligned pedagogical approach using technical devices. However, this policy-shift at the top, resulting from socio-economic reality, has not met with required capacity building at the grassroots levels. The technology orientation needs to improve manifold in the undergraduate level of Higher Education, including the Teacher Education departments, so that all the teaching professionals are sufficiently equipped to face the challenges of the modern classroom in the digital age. Despite the endeavour of the various Curricular frameworks so far, there appears to be an evident gap between the ideals laid down in the documents and the general practice followed in most of the Indian educational Institutions in this matter, excepting a few high-ranking ones. Most of the teachers of higher education are still dependent only on textbooks, black-boards and at best ppts to teach the subjects.

The draft New Education Policy, 2019, recognises teacher preparation and their 'Continuous Professional Development' (CPD) as one of the most important areas where the use of the technology can play a significant role (p.340). It is essential for teachers to receive adequate training in how to leverage technology to improve educational outcomes. Teacher- preparation may itself leverage technology (e.g. through the use of online courses), but the quality of training must be good and commendable. The draft considers the classroom processes of teaching, learning and evaluation as another important area where technology can be impactful. Technology based tools must be created in response to challenges in these areas, in a continuous process.

Moreover, the changing contexts of higher education and training require new perspectives to teach. It is noteworthy that in the 21<sup>st</sup> century, higher education must meet a number of new (and continuing) challenges. 'External pressures have forced institutions to focus strongly on vocational courses at the expense of more scholarly classical studies. Reduced finances available from governments have led to the constant need to find alternative funding arrangements. Extra demands are placed on academic staff to do more with less in respect to their teaching and research. The nature of student cohorts has changed quite considerably, with respect to diversity in ability, cultural background, learning preferences, technology experience, levels of motivation, and the time they are able or willing to spend on their study (Biggs, 2003). The following are typical observations made by teachers of the newer generation of students (Holt et al, 2011, p.2):

- They have less time for everything.
- They pay less attention (often to authority).
- They demonstrate less persistence and endurance.
- They see less need for deep knowledge.
- They have somewhat less fear of failure
- and are open to pursuing alternatives and new options.

It is quite apparent that higher education in modern times are less about instructions targeting memorization of authoritative resources and more about understanding the bases of knowledge, developing higher order thinking, and learning collaborative approaches to knowledge so that the new set of challenges can be

addressed adequately. Teachers who are committed to high-quality instruction produce a learning environment in which students excel academically and develop personally and interpersonally (Bryson, 2001, p.6).

Some countries such as the United Kingdom and Singapore have developed policies which require all initial teacher education programmes to include compulsory courses in the technologies as a strategy for building capacity in relation to them. In other countries, no policy yet exists and teaching teachers about information and communication technologies is at best an option within teacher-education programmes. In Costa Rica, the ministry of education developed the use of the Logo computer program within schools as part of a programme of curriculum reform. Teachers colleges are beginning to experiment with the use of computer-based material to strengthen and broaden their curriculum. Both UNICEF and UNESCO are developing work of this kind.

## Scope and the Structure of the present Study:

The quality of how technology is addressed in teacher education programmes is one of the conditions for how student teachers apply technology in secondary schools after their graduation (Tondeur, van Braak, Sang, Voogt, Fisser, & Ottenbreit-Leftwich, 2012). The techno-pedagogical skills in the teachers would be instrumental in imparting the required know-how in the students. The professional development, thus, would start right from the Teacher-educators and percolate down to the aspiring future teachers of Secondary and Senior Secondary level. Present study focusses on collecting and providing a list of useful ideas regarding how to improve teaching learning environment through the application of educational and communication technology in the Undergraduate classrooms of teacher education. The paper also takes up to highlight the importance and understanding of educational technology as a pre-requisite of techno- pedagogy.

This study is analytical in nature based on the review of empirical research done in India as well as outside India, regarding how to enable the teacher educators in the higher education and the student-teachers in the professional teacher education programme to use a variety of technologies to accomplish tasks. Various Curricular- Frameworks introduced by the concerned agencies in India provide us with an idea to further ponder over the related issues. Apart from these, the article uses the information contained in the sources and resources which could be found in the accessible libraries in a limited space of time and those which could be assessed on the web; appropriately mentioned in the reference given at the end of the article. As such, it provides only the picture that emerges from the study of this very specific set of literature.

This article has following sections:

- a. Background
- b. Empirical research highlighting the hurdles for the teachers in technology integration in the class-room
- c. Exploring global research studies for successful application of technology suitable for Indian Undergraduate class-room
- d. Implication, suggestion and conclusion

**BACKGROUND:**

As far as the department of Teacher Education at the College/ University level in India is concerned, each student entering the Bachelor of Education Programme is generally required to take the paper of 'Communications Technology and Education' during Professional Semester I. The primary focus of the course is to provide some working knowledge and experiences to the students which will help them to effectively infuse technology into their future classrooms. However, this objective is rarely accomplished in most of the Teacher Education institutions. Attainment of quality education depends on the quality of teachers and their enduring professional education and training. But the number and quality of teachers, teaching practice and teacher education are facing severe systemic confronts from corner to corner of the world. Even the at the global level, the research studies indicate the same problem, although a lot of successful experiments are also available.

It has been observed by the investigator as a teacher educator that at several of the local Undergraduate level teacher education institutions, due to apathy of the managements, there is a sub-conscious neglect towards a 'global' vision of good pedagogy in the training institutes in terms of orienting the future teachers in techno-pedagogy. The deep-rooted culture of 'conventional class-room' at the helm of our educational infrastructure is responsible for that. However, it is at this level that trained teachers' initiatives would go a long way in bringing about a uniformity in general standards. So, it is all the more important that Teacher-Training Institutions do not ignore equipping the pre-service teachers in this important aspect of teacher preparation. At such locations, capacity building workshops in collaboration with the Computer and ICT industry and the market-leaders could be incorporated through the initiative of the concerned institutions. Some features of the Indian conditions emerged as follows:

- Apathy of the teachers towards breaking the traditional mould of teaching because of vast nature of hinderances emanating from the students' as well as the management's attitude; (B.V. Gopal and K. Anandan, 2013, Dr. Paul Albert A., 2016)
- Low priority allotted by the Institution due to financial and other administrative reasons and Unavailability of technical support in the institutions (Gupta and Singh, 2009)
- Inability and insufficient knowledge in the faculties to incorporate proper integration of technology and pedagogy, (Dr. K. Nachimuthu, 2010).
- There is significant difference between secondary teacher education students who have attended computer course and who have not attended computer course in their skill in learning, evaluation and techno-pedagogical skills. (Fr. Dr. Sibichen K.K., Kottayam, India, 2017)
- Rare efforts by the institutions towards meaningful and relevant capacity building efforts

Even in the cases where pre-service teachers did have some degree of knowledge with regard to information and communication technologies (ICT), Gupta and Singh (2009) in his study titled, 'Usage Of E-Learning Tools: A Gap in Existing Teacher Education Curricula in India', found that though the curricula related to e-learning was ample in the selected university but the infrastructural facilities were not accomplished in many terms like internet connection and time provided to use it. The trainee teachers were skilled with the basic computer applications but they are lacking the skill of using various special skills required for e-learning. Also, the usage of e-learning tools by teacher educators like email, chat, discussion groups, downloading the content was average but they are not involved in preparing online courses, taking online classes, video conferencing and uploading the educational content. Similar results were found in case of trainee teachers.

The effects of blended learning strategy on teacher training programmes is an area which researchers in India have hardly explored.

It is apparent that although the very essence of Professional Education Programme emanates from primacy of principles of teaching and learning, active participation of the faculty and student teachers in the activities and dialogue addressing the objectives of the programme are seldom met. The over ponderance of lecture method in the classroom teaching and at best a parallel existence of technology in the class, fails to inculcate in the students a proficiency or even an average skill towards use and application of technology for achieving effective learning in their role as Secondary and Senior Secondary teachers at their workplace.

A survey made by the Human Resource Development Centre, Kamraj University Madurai, of 150 University, College teachers and teacher educators from colleges of education attending the Orientation Programme, revealed that most of the teachers are personally using all the web resources like blogs, wikis, MOODLE & MOOC, online courses, social networks, software, documents and mobiles. (Vijaya R. 2017). The inference drawn was that If all the teachers use all these resources for imparting the subject and other relevant knowledge to stu-

dents, quality of higher education would definitely rise.

International research corpus also reveals that the trainee teachers '... have little know-how or techno-pedagogical ability with which to integrate those technologies into their teaching practice' (Karsenti 2001, 35). According to Mehlinger (1996) Most pre service teachers know very little about effective use of technology in education. Many studies have been conducted with regard to the attitude of teachers towards use and integrations of technology have revealed the importance of attitudes for learning to use technologies (Cox, Rhodes & Hall, 1988; Davidson & Ritchie, 1994; Hannaford, 1988; Kay, 1990). These findings were further supported by Bandalos & Benson, 1990; Dupagne & Krendl, 1992; Francis-Pelton & Pelton, 1996; Loyd & Gressard, 1984a; Mowrer-Popiel, Pollard, & Pollard, 1994; Office of Technology Assessment, 1995.) Several studies have found that individuals' attitudes toward computers may improve as a result of well-planned instruction (Kluever, Lam, Hoffman, Green & Swearingen, 1994; Madsen & Sebastiani, 1987; Woodrow, 1992). Like other individual characteristics that are hypothesized to play a role in the continued growth of technology proficiency, attitudes and beliefs can't be easily taught and must be developed by an individual over a period of time.

**Hurdles in technology integration by the teachers:**

Some of the hurdles that inhibits the practitioners from adopting their techno-pedagogical knowledge and skills may be personal and psychological in nature. One factor that is noted to have a profound effect on the student teacher's attitude towards technology and its integration, is computer anxiety. Computer anxiety, as defined by Rohmer and Simonson (1981), is "the mixture of fear, apprehension, and hope that people feel while planning to interact or while actually interacting with a computer" (p. 151). The level of anxiety could be reduced with increased experience in using and working with computers and thereby succeeding in reaching goals. Secondly, researchers have indicated that although teachers may have positive attitudes toward technology, they may still not consider themselves qualified to teach with it or comfortable using it (Duane & Kernel, 1992). 'Self-efficacy', which the teachers must feel about using the computers can be understood as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with the judgments of what one can do with whatever skills one possesses" (Bandera, 1986, p. 391).

When the concept of computer-efficacy is applied to the domain of learning to use computers in teaching, hands-on computer experience becomes an important component in effective instruction at the pre-service level. of the practical component in it. Carney (1998) found four factors that were common to exemplary computer-using teachers: challenges to frames of reference, situated learning, collaborative reflection and long-term collegial interaction. These combined factors helped teachers to integrate technology.

Another factor that has shown to impact on teachers' integration of computers in the classroom was students' expertise in computer use (Hruskocy et al, 2000). In her article, Shazia Mumtaz (2000) reports on the literature associated with practising teachers' uptake of information and communications technology (ICT). The study reveals a number of factors which influence teachers' decisions to use ICT in the classroom: access to resources, quality of software and hardware, ease of use, incentives to change, support and national policies, commitment to professional learning and background in formal computer training. She concluded that the implications of the review of literature is that teachers' theories about teaching are central in influencing teachers to use ICT in their teaching. Even if teachers are provided with up-to-date technology and supportive networks, they may not be enthusiastic enough to use it in the classroom. Teachers need to be given the evidence that ICT can make their lessons more interesting, easier, more fun for them and their pupils, more enjoyable and more motivating.

It is clear that familiarisation with the concept of Education and Information and Communication Technology is primary in the endeavour to apply these skills in the classroom. Unless and until the teachers are educated in this regard, their effort at interlinking and integrating technology in their teaching process is going to face issues.

**Understanding the Meaning and Theoretical Premise of Techno-pedagogy:**

Techno-pedagogy, generally understood as the skill of blending the techniques and principles of teaching and learning into the learning environment, is essentially an aspect of the discipline of Education Technology. It gives an idea about the family of teaching models to the teachers. Thus, it focuses upon enabling in the teacher the skill of designing appropriate learning situations by adopting the content specific teaching principles and techniques. In other words, it refers to employing the essence of Educational technology (ET) in the class-room situations. 'ET could be defined in simple terms as the efficient organisation of any learning system, adapting or adopting methods, processes, and products to serve identified educational goals.' (Position Paper, NCERT, 2006). This would involve, among other administrative and policy related aspects,

- Systematic identification of the goals of education, taking into account nationwide needs, the system capabilities, and the learners' needs and potential.

- Designing, providing for, and enabling appropriate teaching-learning systems that could realise the identified goals.

The second aspect of Techno-pedagogy involves employing suitable knowledge of basic technology (ICT) and the art and skill of "webogogy" (Khirwadkar, 2005) by the teacher to enhance the pedagogy. Khirwadkar explains the term 'webogogy' as developing web-based learning approach by making use of Internet technology, exploring it, accessing information from it to use in teaching learning, ethical issues involved etc. Internet technology, however, is only a partial reference to Information and Communication Technologies, which involve several other features which can be used to the advantage of the teaching learning community. It broadly includes the handling and processing of information which may be in the form of texts, images, graphs, instructions and so on for use by means of electronic and communication devices such as computers, cameras, telephones, etc.

Appropriate integration of this technology with the theoretical principles of teaching in the learning situations is what is the techno-pedagogy is all about. The issue that we are addressing here is enhancement of pedagogical outcome emanating from the specific objectives of the teaching -learning content prescribed in the curriculum of the course. The whole purpose of using technology in teaching is to give better value to students (Miller et al., 2000). As Ian W. Gibson (2001) refers to his notion of 'pedagogy of learning' in following words:

"It is often argued that certain teaching styles or learning styles are incompatible. While it is true that some identifiable teaching styles are often derived from vastly different philosophies related to beliefs about how learners learn, or how learning occurs, in practice it is inappropriate to argue that one style is necessarily incompatible with or more effective than another, without first referencing learner, objective and context. The knowledge instruction and knowledge construction classrooms..., while dramatically different, are not necessarily incompatible. Rather, they may be viewed as equally defensible positions on a continuum of possible teaching strategies available to the discerning teacher concerned with a variety of learners, a variety of learning objectives, and a variety of learning contexts."

Focussing more upon some specific computer related skill-set which serve as the essential requirement for successful integration of new age technology in the present context, the technological skills include the following as given under:

- Basic technological skills, e.g. handling of computer, internet and other media like mobile phones, overhead projectors etc. in combination;
- Technology usage skills for knowledge acquisition and personal development, for example ability to operate the search engines and access to open educational resources;
- Technology usage skills for planning and preparing lesson plans with special reference to introduction and micro teaching;
- Technology usage skills for delivering lessons, for example clear communication and linking of technology with pedagogical exercises

#### The concept of technological pedagogical content knowledge: TPACK Framework

In the article, 'What Happens When Teachers Design Educational Technology? The Development Of Technological Pedagogical Content Knowledge', also referred to as TPACK Framework, (Koehler, M. J. and Mishra, P. 2005), the authors have observed the teacher's knowledge about technology as important, but not separate and unrelated from contexts of teaching i.e., 'it is not only about what technology can do, but also, and perhaps more importantly, what technology can do for them as teachers'. Depending upon the nature of content, scope of content, and level of students, appropriate technology integration must be sought. Technology as an aid enhances the process of learning and helps in achieving higher level objectives.

Techno-pedagogy has been visualised by them as having following three corner points:

- Content (C) is the subject matter that is to be taught,
- Technology (T) encompasses standard technologies, such as chalk and blackboard, overhead projector, computers as well as more advanced technologies not commonly integrated in the classroom such as Internet, digital video, educational games and interactive online learning environments.
- Pedagogy (P) describes the collected practices, processes, strategies, procedures, and methods of teaching and learning. It also includes knowledge about the aims of instruction, assessment, and student learning.

The TPACK framework suggested that the integration of technology required teachers to have strong content knowledge (CK), pedagogical knowledge (PK),

and technology knowledge (TK). Further, they needed to seamlessly weave these knowledge bases together as they developed pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical knowledge (TPK), as well as technological pedagogical content knowledge (TPACK). The TPACK framework has its roots in the work by Shulman (1986) who suggested that good teaching involves blending content and pedagogical knowledge; Mishra and Koehler extended the model to incorporate technological knowledge.

In the background of the basic familiarity with these concepts, it would do us good to explore some of the global studies in search of best practices which can be adopted by the teacher educators as well the potential school teachers in Indian conditions.

#### Exploring Global research studies for successful application of techno-pedagogy in the class-rooms:

Bryson (2001) noted that there is a growing expectation that teachers adopt at least the core tools including Learning Management Systems, classroom computers, data projectors and the use of PowerPoint. Beyond these, more teachers are using the Internet in class and email is the dominant form of communication between teachers and students. Add the benefit of digital imaging, scanning technologies and video and audio clips on CDs and DVDs, as well as the advent of such resources as Facebook and YouTube.

Collis & Jung (2003) described that the use of ICT within teacher training programs around the world is being approached in a number of different ways with varying degrees of success. These approaches were subsequently described, refined and merged into following approaches:

- **ICT skills development approach:** Here importance is given to providing training in use of ICT in general. Student teachers are expected to be skilled users of ICT for their daily activities. Knowledge about various types of software, hardware and their use in educational process is provided.
- **ICT pedagogy approach:** Emphasis is on integrating ICT skills in a respective subject. Drawing on the principles of constructivism, pre-service teachers design lessons and activities that centre on the use of ICT tools that will foster the attainment of learning outcomes. This approach is useful to the extent that the skills enhance ICT literacy skills and the underlying pedagogy allows students to further develop and maintain these skills in the context of designing classroom-based resources.
- **Subject-specific approach:** Here ICT is embedded into one's own subject area. By this method, teachers/subject experts are not only exposing students to new and innovative ways of learning but are providing them with a practical understanding of what learning and teaching with ICT looks and feels like. In this way, ICT is not an 'add on' but an integral tool that is accessed by teachers and students across a wide range of the curricula.
- **Practice driven approach:** Here emphasis is on providing exposure to the use of ICT in practical aspects of teacher training. Focus is on developing lessons and assignments. Using ICT and implementing it in their work experience at various levels provides students with an opportunity to assess the facilities available at their school and effectively use their own skills (Collis & Jung, 2003). It follows that ICT in teacher training can take many forms. Teachers can be trained to learn how to use ICT tools. ICT can be used as a core or a complementary means to the teacher training process.

Nietfeld and Cao (2003) examined the type of instructional strategies that promote pre-service teachers' self-efficacy within a college course. Students perceived active more than passive instructional strategies to be important for increasing their personal teaching efficacy. Moreover, students with the highest gains identified whole group discussion, peer collaboration and in-class illustration exercises as the most beneficial.

Khirwadkar (2005) in her study focuses on issues relating to ICT in education as a core component in pre-service teacher education and the different models to be adopted for its integration. She has given a list of practical suggestions regarding the various skills and competencies to be developed on the part of student teachers, some of which are noteworthy:

- Developing lessons plans incorporating student use of technology in the learning process.
- selecting appropriate software for a particular subject and per student needs.
- Generating printed documents like student assignments, newsletters, communication, etc. utilizing a variety of applications software like word processing and desktop publishing.



- Developing tools to evaluate technology-based student projects
- Using the Internet to support professional development including locating professional organizations, communicating with other teachers electronically, and participating in on-line professional development workshops and seminars.

As new types of education friendly technology became available, new ways of its application in the classroom became popular. Several international studies conducted in the area of blended learning indicate that it could be more powerful and even transformative for higher education as compared to other forms of learning (Garrison & Kanuka, 2004; Bransford, Brown & Cocking, 2000; McCombs & Vakili, 2005). Despite the recent advances of blended learning in the field of education, there is little research into how online learning is actually being used in educational institutions by blending face-to-face instruction or how learning platforms can benefit learning.

Report by Tony McAleavy, Alex Hall-Chen, Sarah Horrocks and Anna Riggall, titled, 'Technology-Supported Professional Development for Teachers: Lessons from Developing Countries' gives encouraging details about how the teachers' professional development is linked with technology and collaboration in the classrooms through taking up six case from developing countries including India. The authors state that the teachers are likely to reject new ideas that conflict with their current ideas unless, as part of the professional learning, the conflict is explicitly addressed. Teachers usually need to try out new ideas many times in an environment of support and trust. Teachers (particularly those from schools facing challenging circumstances) may need help relating to their sense of efficacy: they need to believe better outcomes are possible for their students.

Actually, as indicated by Collins and Jung, stand-alone ICT courses have continued to be a serious part of many initial teacher preparation programmes (Gronseth et al., 2010). However, several studies have found that stand-alone technology courses are ineffective in providing teacher education candidates with appropriate preparation to successfully integrate technology into their instruction (Karatas, 2014; Polly, Mims, Shepherd, & Inan, 2010). Various studies have highlighted the value of integrating technology into methods and content courses to foster technology skills more strongly connected to use in K-12 (i.e. primary and secondary) instruction and cognitive development of student teachers (Pierson & Thompson, 2005; Childs, Sorensen, & Twidle, 2011; Tondeur, van Braak, et al., 2012).

The case study on India, titled, 'Teacher Education through School-based Support in India (TESS-India)' reports that the project aims to improve teacher education in India through the provision of free and adaptable OER containing activities, case studies and reflection prompts for teachers. It seeks to support the adoption of more engaging, inclusive teaching in regions where more limited pedagogies have hitherto dominated education systems. The project was initiated at the behest of the Indian government to help address the issue of teacher quality. The country's rapidly rising learner numbers, coupled with poor learning gains for many, had led the federal government to recognise the critical need for changes in classroom practice and to target primary and secondary school teacher training, both pre-service and in-service. The project, which has been in operation since 2012, is funded by UK Aid and led by Save the Children India and the Open University. The country's rapidly rising learner numbers, coupled with poor learning gains for many, had led the federal government to recognise the critical need for changes in classroom practice and to target primary and secondary school teacher training, TESS-India's approach of using online platforms to enable the development, distribution and adaptation of text-based OER materials for teacher education and self-study, and also sought to use technology to enable wider dissemination of the materials. The OER are freely available online through the TESS-India website, interactive learning platforms, YouTube videos and Facebook, as well as offline on DVDs, memory sticks and micro SD cards, enabling access anywhere on teachers' own mobile devices. This accessibility is aided by the fact that the materials are specifically adapted for small screen use.

In her project, Patricia Dickenson compared two identical courses of a teacher education program to determine if a flipped approach would have a greater impact on pre-service teachers' self-efficacy than a traditional course. Pre and post-test results revealed students in the flipped classroom had a significantly higher gain in self-efficacy than students in the traditional course. Flipped classroom is an example of using technology in a flexible way to create more student-centred learning in class is involving the principle of inverted learning ('Flipping the Classroom'; Davis, 2013), which refers to an instructional model that 'adjusts the design and delivery of instruction so students take the lead and responsibility for learning before class and the instructor can spend class time working on applied learning activities' (Davis, 2013, p. 241).

Hiroki Yoshida, in her research project, addressed the two research questions: 1) What do university students majoring in education find useful about "flipped learning?" 2) What is the structure of participants' perceived usefulness of "flipped learning?" The results of the study suggest that learners' perceived usefulness of "flipped learning" on instructional design consists of not only technology-related usefulness but also usefulness of the learning process. As "flipped

learning" is not a synonym of online videos of online courses, but is "blending of direct instruction with constructivist learning," it is significant to focus on the whole learning process to ensure the quality of "flipped learning."

In recent years, Buss et al (2017) experimented with a 'Technology infusion approach' by removal of technology paper and infusion of relevant technology in method papers instead. Ray R. Buss, LeeAnn Lindsey, Teresa S. Foulger, Keith Wetzel, & Stacey Pasquel (Arizona State University), examined the benefits of preparing teacher candidates (TCs) to integrate technology into their future teaching by infusing technology integration instruction into program methods courses. They surveyed 237 TCs who rated perceptions of their technology integration skills, general preparation, self-efficacy for teaching, and so on. Results indicated TCs believed they were as well prepared to integrate technology as they were prepared to teach in general. Qualitative data provided information on how they had used technology during student teaching and how they intended to use technology in their future classrooms. The researchers concluded in their study that technology integration was successfully taught in technology-infused methods courses, but they also inferred that they must continue to improve this technology-infused methods course instruction and instructors to more fully achieve their goals of sound technology integration by all TCs.

In their study, Wilfried Admiraal et al (2017) found that in teacher education programmes, a technology-infused approach can provide the concurrent and authentic content and pedagogy, supporting student teachers with the interactive nature of content, pedagogical and technological knowledge. Two main enablers of student teachers' learning to teach with technology were recognised by them as

- teaching practice to enact what was learned in teacher education as well as to receive feedback from students on this enactment, and
- modelling of teacher educators and teachers in school

However, they also concluded that both enablers might require further development of knowledge and skills of both teacher educators and cooperating school teachers.

Regarding the efficacy of evolving technology in conceptualizing pedagogy and practice in Higher Education, Ali (2019) in her study explored the staff members' technological know-how and how they were able to influence learning at a University in Fiji. The teaching staff in the study consisted of a wide range of academics but majority (76%) of them are at lecturer and assistant lecturer level. Findings revealed that majority of the staff members appreciate the importance of ICT integration in learning and teaching. While many (26%) of the staff members use laptop, projector and speaker as major tools for integrating ICT in their classes, majority (51%) use only laptop and projector. A few (7%) of the staff members were found to be using tablets and smart phones effectively in their classes. Lecturers seem to be more familiar with PowerPoint and integrate educational videos to supplement their teaching and this assimilation in turn makes learning meaningful and enjoyable for the students.

Subsequently, Moodle (45%) and YouTube (42%) seem to be the most common learning platforms used by staff members.

Watson, Sunnie Lee et al (2020) examined the beliefs and perceived attitudinal learning of preservice teachers in a technology integration course that utilized digital badges as a way to model effective technology integration. It also examines their perceptions of the instructional design of the course and the efficacy of digital badges as a learner-centered learning technology. Results showed that students by far perceived digital badges as the most beneficial aspect of the course to their attitudinal learning. In regards to their attitudinal learning, students perceived the highest growth in their cognitive learning and the lowest in their affective. Students perceived the lack of resources as the primary barrier to technology integration in their future classrooms.

#### IMPLICATION, SUGGESTION AND CONCLUSION:

While there was limited documented experience on the effectiveness of the new technologies for teacher education, Perraton, et al (UNESCO, 2001) categorically noted that the available evidence suggested three lessons for planners, mainly about capacity building. The suggestions mentioned below, still hold good:

- First, the development of teachers' capacity in using the technologies cannot happen in isolation. Plans need to take account of the use of the technologies elsewhere in the education system and in the wider environment. The technologies necessitate an appropriate technical infrastructure and funding to support it.
- Second, if the use of the technologies is seen as a function of teachers generally, this needs to be reflected in national policies and strategies and in the curriculum for both initial teacher education and continuing professional development.
- Third, while teacher educators are a key element in establishing the use

of information and communication technologies in education, many teacher educators themselves lack skills and training in the use of the technologies or opportunities to apply and develop their knowledge and skills.)

Bruner (1996) claims that all teachers have theories about how their students learn, which informs their approach to teaching. Bruner's four models of pedagogy are: (1) the acquisition of 'know how', where learners are imitative learners; (2) the acquisition of propositional knowledge, where they learn from didactic exposure; (3) the development of inter-subjective interchange, where they are thinkers; and (4) the management of 'objective knowledge', where learners are knowledgeable. These principles can be adopted in higher education scenario too. The TPACK framework (Technological, Pedagogical and Content Knowledge), which has hugely developed after its introduction by Mishra and Koehler in 2006, provides a rationale for a technology-infused approach.

Since most of the undergraduate educational set-ups in India follow the traditional system of class-room instruction, capacity building of the teachers not only in the knowledge of technology, but how it can be merged with pedagogy in the Indian college or University classroom is very much the need of the day. Obviously, the managements and policy makers are vital factors in the achievement of this educational goal, but the teachers can also pay attention to their professional development and devise their own unique ways in this direction. The ethical issues to be kept in mind in this regard is that it is essential that teachers follow copyright regulations regarding the use of digital material. These are outlined quite clearly by most colleges and in general copyright regulations which are very generous to teachers.

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